

THE SCIENCE NEWS-LETTER

A Weekly Summary of Current Science

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ISSUED BY
SCIENCE SERVICE

B and 21st Streets
WASHINGTON, D. C.

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SUBSCRIPTION: \$5 A YEAR, POSTPAID

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Vol. V. No. 173

Saturday August 2, 1924

CUBICAL CULTIVATION

By Dr. Edwin E. Slosson.

The city man has the advantage of the countryman in that he can expand his business perpendicularly. Our city "squares" have become cubes, but the farmer lives in Flatland like all his ancestors. When he buys an acre of land he only gets an acre area. But when the city man buys an acre he piles story on story till he gets ten or twenty acres of floor space out of it. The forester, it is true, can raise his foliage factory to the height of a house, but then the shaded space beneath becomes useless.

But in part of the world these limitations on life do not apply and this is the greater part of the earth's surface; in fact, 71 per cent. of it. For water, unlike soil, is transparent, and the sunlight, which supplies the vital energy to all vegetation, can penetrate the ocean to the depth of a thousand feet or more, which beats the sky-scraper by far. Think of having a garden measuring five hundred feet by five hundred feet by five hundred feet full of growing vegetation! And what a pasture that would make for stock able to feed off every cubic foot of it!

Such garden plots and such pastures there are in the sea but so far man has done nothing in the way of cultivating them. His control stops with the shore. The modern man merely hunts in the ocean as his ancestors did in the forest, unsystematically, wastefully, often disastrously, destroying what he desires.

Man has hardly yet begun to consider the conservation of the wild life of the sea, still less its cultivation. These are questions for the future. But this future is rapidly coming, for each year the fishing craft have to go farther and farther out to sea and use more power in getting their haul. British trawlers can now get only about half their fish from the North Sea, and they are forced to trawl the banks of the Faroe Islands and Iceland. It takes eight to ten tons of coal to catch a ton of fish and the trawler gets on the average only about five cents a pound for it at the port. Before the war a British steam trawler of 125 feet in length could be run profitably for less than \$20,000 a year. Today it costs some \$50,000. Coal and nets are twice the prewar price.

The herring fishing of Great Britain has been hardest hit by the war. In 1914 the industry was worth nearly \$25,000,000 a year and employed some 60,000 people. More than 2,250,000 barrels of pickled herring were exported. But 70 per cent. of these exports went to Russia and 20 per cent. to the German, and now the Russians have locked their doors and the Germans have scant money to pay. Poland and the United States have curtailed the market by putting duties on

imported herring. Consequently, British fishers are asking Government aid and protection against foreign fish, a sad situation for an industry that has maintained its proud independence and supremacy for five hundred years.

In 1424 the herring migrated in mass from the Baltic to the North Sea for some mysterious reason, and this sudden shift of the shoals built up the British sea power and made Germany and Russia dependent upon British fishermen. We may hope that eventually the financial embarrassments and the present impediments to commerce may be removed or readjusted, but until we learn more about ocean life we shall not be able to make full use of the harvests of the sea. We have taken the first step when we realize that there is a "reason" for such a migration even though we must admit that it remains "mysterious". If we open the stomach of a herring, we may find it contains as many as 60,000 copepods. The copepods are primitive crustaceans that look like tiny shrimps. They feed on the minute plant forms found in the thick sea-soup, called "plankton", that is scooped up in a tow net. There are 2,500 diatoms to one copepod. Now the diatoms are extremely sensitive to changes in the composition of the sea water, its alkalinity and the percentage of salt and lime it contains. And, of course, the growth of all such vegetation depends upon the amount of sunshine that falls upon the sea and the depth to which it penetrates. The diatoms swarm when the temperature gets right. With them come the copepods that browse upon them. The fish eat the copepods and we eat the fish. So our Friday dinners depend upon the diatoms and national prosperity may be determined by the plankton.

Herring on the Atlantic side of Ireland and of Nova Scotia are larger than in the interior waters on the other side. The warmer the water, the saltier the sea, and the greater the amount of oxygen in the water the faster grow the fish. But the oxygen in the water increases with the atmospheric pressure, so the growth of the young herring varies with the barometer.

That is why the biologists of the marine research stations of Wood's Hole on the Atlantic, and La Jolla on the Pacific are continually analyzing the sea water, taking the temperature of the ocean and patiently counting the copepods and diatoms with the microscope.

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HIGHWAY RESEARCH BOARD HAS NEW DIRECTOR

The appointment of Charles M. Upham, state highway engineer of North Carolina, as director of the Advisory Board on Highway Research of the National Research Council has ^{been} announced.

This body has as its function the coordination of highway research in all parts of the country. Under the directorship of Dr. W. K. Hatt, who has rejoined the faculty of Purdue University, a survey of the road experimental work at universities and by highway commissions was instituted. A member representing each

state highway department was recently added to the board.

DOMESTICATED YEAST TURNS AIR NITROGEN INTO FOOD

A yeast has been discovered that is regarded in informed circles as having immense future possibilities in enlarging the available supply of nitrogenous food. It is a variety of yeast capable of assimilating nitrogen directly from the air when grown in solutions of sugar and minerals free from any other source of nitrogenous nutriment.

Dr. E. I. Fulmer of Iowa State College developed this yeast, known as *Saccharomyces cerevisiae*, Race F, from a cake of commercial yeast. The secret of this success lies not only in the race of yeast used but also in the development of the proper balance of salts and sugar in the medium by methods developed in his laboratory.

Hitherto the only organisms of any economic importance capable of assimilating nitrogen from the air have been the nitrifying bacteria which grow on the roots of clover and other leguminous plants. The nitrogen absorbed by these organisms is not directly available as food for man or beast, but occurs chiefly in the form of nitrates which nourish the following crop.

The new yeast is what may be called a domesticable organism, suitable for direct consumption by man and animals, which does not especially require for its growth a preexisting supply of nitrogen in the form of nitrates or ammonia.

The potential importance of this discovery lies in the fact that it indicates a possible way of utilizing enormous quantities of saccharine materials which now go to waste, especially in outlying regions of the world. For instance the cane sugar industry, which is mainly confined to tropical regions, produces vast amounts of molasses for which no market can be found, notwithstanding that large amounts are employed in the manufacture of alcohol and stock feed. Molasses consists mainly in carbohydrates in the form of sugar; carbohydrates in general are the most abundant of the common constituents of foods, but they cannot take the place of proteins - that is, foods containing nitrogen. By using cheap and abundant carbohydrates to support the growth of yeast while it is fixing the nitrogen of the air in the form of protein, the economical production of nitrogenous foods may be greatly expanded.

READING REFERENCE - Kendall, Arthur I. Civilization and the Microbe.
Boston and New York, Houghton Mifflin Company, 1923.

NEW VITAMIN CONTROLS MILK PRODUCTION

A new addition to the list of known vitamins has been made by Dr. Herbert M. Evans of the University of California. It is still so new that it has not been given a distinguishing letter like its older brothers, Vitamins A, B, C, D, and X, but its importance in the scheme of things is very great, for apparently milk of proper nutritional value can not be produced without it.

Its discovery followed the development of knowledge about the next youngest

of the vitamin family, Vitamin X, the so-called "fertility vitamin", necessary for the production of young, also discovered by Dr. Evans. Animals fed on a balanced ration, but lacking Vitamin X, grew and mated normally, but produced no offspring. When foods containing Vitamin X were added to their diet, even in minute quantities, the ban of sterility was broken, and young were produced. The experimenters found, however, that this more or less artificial combating of race suicide was only partially successful, because such sterile animals, rendered fertile by doses of Vitamin X, would bring forth only one litter of young ones. And when extraordinary precautions were taken to exclude all possible impurities from their ration of the fertilizing vitamin, it was found that though they could still become parents, the mother could not successfully suckle her babies. At weaning time the offspring of an animal on a "pure" diet weighed on an average only half as much as those of one on a "mixed" diet of ordinary foods.

There was, of course, the possibility that the young of the animals on the "pure" experimental diet were handicapped in some way at birth, and could not grow properly even if they had normal milk. Dr. Evans checked up on this by mixing his litters, giving each mother three offspring of normal animals and three of experimental animals. It was found, however, that all the sucklings, both normal and experimental, nursed by a "pure diet" animal failed to gain weight, while even the offspring of "pure diet" mothers, when fed on the milk of a normal animal, gained as rapidly as did their perfectly normal foster-brothers.

Dr. Evans therefore concludes that "it seems established that the function of lactation demands for its normal expression either one or more dietary elements different from those adequate for normal growth and for normal reproduction, or else larger quantities of certain dietary elements."

READING REFERENCE - McCollum, E. V. The Newer Knowledge of Nutrition. New York, Macmillan Company, 1922.

NATION GOVERNED BY "FATHERS AND MOTHERS"

Civilizations vanish - Babylon, Egypt, Greece, Maya, Aztec, all dumped in the trash heap of time. But up in Brantford, Ontario, the remnants of one superseded culture persist stubbornly - that of the old Five Nations or Iroquois tribes.

This is the word brought back to Washington by J. N. B. Hewitt, specialist of the Bureau of American Ethnology of the Smithsonian Institution recently who returned from a study of the picturesque ritual attending the installation of a federal chieftain of the Five Nations. Mr. Hewitt went to Canada especially to obtain a more accurate understanding of the chants used in the ritual.

His studies have convinced him, Mr. Hewitt says, that the Five Nations had developed a system of government superior to anything else north of Mexico when the white men came. It was based entirely on a symbolic conception of the dual functions of nature - male and female. Thus the federal chieftains representing four of the tribes at the council fire would symbolize the father function and would discuss any measure of local government or policy until an agreement finally was reached. Meantime, the representatives of the fifth tribe, symbolizing the mother function, would sit on the opposite side of the fire - silent during the disputes. But when the debate was over the question as decided would be passed to them for final judgment. They could either accept it or send it back

to be killed or altered.

Conceived on the same lines, the House of Representatives might be considered the father chamber and the Senate the mother chamber.

The persistence of this form of government is such that the Iroquois still are ruled by it in everything except criminal affairs, when the Canadian government steps in. They remain a proud people. Many of them still claim to constitute a separate nation and continually are demanding freedom from Great Britain, having carried their claim even to the Hague tribunal.

BOY BABIES MORE LIKELY WHEN MOTHER IS YOUNG

If the mother is young the chances are greater that the baby will be a boy. When the mother is forty or beyond the probability is stronger that will will be a girl. This is the conclusion of Dr. A. S. Parkes based on the record of over eight thousand births at a hospital in Manchester, England. Mothers averaging around 20 years of age had 120 male to every 100 female children. Mothers who were about thirty years old bore 112 boys to every 100 girls. Those about forty years of age had 91 male children to 100 female; and the ratio decreased still more for still older women.

Dr. Parkes is careful to point out that his facts do not necessarily conflict with recent scientific ideas of sex-determination. These modern ideas teach that among the higher animals, including man, the female exercises no influence on the sex of the offspring since egg-cells are all alike. The male parent, however, forms germ-cells of two kinds in equal numbers and maleness or femaleness of progeny depends upon which of these two kinds of cells happens to fertilize any egg. The decision as to sex is irrevocably made at fertilization and Dr. Parkes's statistics are for a subsequent event, i.e., birth. Between these two events a dying-off of the unborn has been noted which for some unexplained reason affects males more than females. This early dying-off increases with the age of the mother. So, science would naturally expect sons to be less frequent, on the average, in older households.

"BLACK" LILIES POSSIBLE FOR AMERICAN GARDENS

"Black lilies" for American flower gardens are a possibility of the future.

The Bureau of Plant Industry of the U. S. Department of Agriculture will experiment with seeds of a small lily ten to twelve inches high which grows in the alpine meadows of the Sila Pass in China at an altitude of about 12,000 feet. It is described by the Bureau as "well worthy of cultivation on account of its drooping, rich, purplish black, bell-shaped flowers tinged with carmine which are one or two inches long and broad.

This species was collected by J. F. Rock, collaborator for the Bureau, during his recent exploration of the Yunnan province of China.

The introduction of a number of other promising flowers and decorative shrubs for the American flower lover is announced by the Bureau this month. All of

these, of course, merely are subjects for experimentation at present and may not succeed under the conditions they must contend with in the United States.

Seeds have been received of the *Corokia virgata*, a slender branched shrub, six to twelve feet high, native of the most northern part of New Zealand where mild weather prevails. The shining green leaves are downy white underneath, and yellow blossoms, about half an inch across, are borne in three-flowered clusters. It is a lawn possibility for the Southern states.

Experiments also will be conducted with a slender-branched, shrubby honeysuckle from Yunnan, China. The yellowish white flowers are marked with red and are followed by bright red berries.

From the mountains of western China also come the seeds of a climbing shrub, *Schizandra rubiflora*, which often reaches a height of twenty feet, with solitary, dark red flowers about an inch across.

Hon. Vicary Gibbs of Aldenham House Gardens, Herts. England, who forwarded the seeds of these three last-named shrubs to the Department, has also sent the seeds of two species of *viburnum*. The first is a hardy, ornamental shrub about seven feet high, from the mountainous country of Western China with narrow, toothed, metallic green leaves, white flowers in lax panicles, followed by small red berries. The second is from Japan, similar in appearance to its companion, but with a higher growth.

The Bureau plans efforts to make more popular in the United States the famous Mexican tiger flower, *Tigridia pavonia*, and has secured a large quantity of seed which will be grown in the greenhouses at Bell, Md. It is a bulbous plant adapted for mass planting. Although the individual blooms last but a short time the mass planting produces a succession of yellow, orange, scarlet, and red flowers which are very striking. It is similar to the *gladiolus* and as easily grown.

IS "ATHLETIC HEART" A MYTH?

A severe jolt has been handed to the idea, long accepted as a commonplace in medical and athletic circles, that severe athletic training and participation in competition, especially in long races, was "hard on the heart", and tended to cause permanent enlargement of the organ.

The staff of the Peter Brent Brigham hospital have just published the results of their X-ray studies, made on American and Canadian youths who took part in the 25 mile American Marathon.

The men had all been training for some months immediately preceding the race, and most of them had been doing long distance running for from five to fifteen or more years. It was found that the heart size of the men was normal, and the lung capacity likewise was apparently unaffected. Immediately after the race it seems that there was a temporary decrease in heart size, gradually returning to normal in about one day.

TUMOR GROWTH AFFECTED BY SUNLIGHT

That the growth of malignant tumors is related to the general weather conditions and to sunlight in particular has been shown by investigators in the Rockefeller Institute for Medical Research. Drs. W. H. Brown, L. Pearce, and C. M. van Allen have had a number of rabbits suffering from malignant tumors, under observation.

A comparison of meteorological records and the growth of tumors in diseased rabbits revealed a striking coincidence between the decrease of tumor growth and the periods of maximum and minimum sunlight, i.e. in summer and winter seasons; while the greater malignancy occurred at the times of sudden and rapid changes in the hours of sunshine per day. The latter periods correspond roughly with spring and fall of the year.

NEW STONE AGE RELICS DISCOVERED IN EGYPT

King Tut-ankh-amen, who has reigned supreme in archaeology and journalism for the past two years, will have to soon share honors with earlier and less spectacular monarchs and even with unnamed commoners of the Age of Chipped Flints, according to present indications. Sir Flinders Petrie, the world's foremost Egyptologist, tells of a number of interesting, even startling, developments of recent date in the Nile country.

In the first place, back of all the dynasties of pyramid-building and tomb-carving Pharaohs, Egypt, like Europe, had a Stone Age. Flint weapons and household pottery and ornaments have been turning up for some time in the deeper excavations; but the latest finds have been of a pattern that dates them as older than the oldest yet found in Egypt. And what is of especial interest, they are of exactly the same pattern as the flints and earthen wares found at Susa, the earliest pre-Babylonian kingdom in western Asia, and at Solutre, in France; and were therefore probably made by the same race of men. This goes hard with the older theories, which have always assumed that Egypt was always isolated from the rest of the world, and developed its peculiar culture wholly independently.

Another blow to this idea has been discoveries of records of a Syrian conquest, and of two dynasties of Syrian kings ruling Egypt, immediately after the building of the great pyramids. One inscription shows a Syrian king (who bore the pleasant name of Khady) receiving homage from both Asiatic and Egyptian subjects. Later records show a race of dark-skinned kings, presumably from the south, and a disappearance of any reference to Asiatic matters. It appears therefore that even the earliest days in Egypt had little of the tranquility that used to be ascribed to them, but that the rich lands of the Nile valley were as tempting to invaders then as they were later.

Rich deposits of ores of the rare elements, zirconium and hafnium, valuable because of their radio-active properties, have been found in Madagascar.

Young chickens are frequently killed by eating rose bugs.

TINY PLANT PARASITES STRIP SYCAMORE TREES

Sycamores in Illinois, Ohio, Pennsylvania, New Jersey, West Virginia, and Arkansas are being completely stripped of leaves by a heavy infection of sycamore blight, a fungus disease known as *Gnomonia veneta*, according to reports received by the U. S. Department of Agriculture. In Ohio the same plant parasite which is damaging the sycamore has also attacked the white oaks. Many valuable trees will be severely damaged if not completely killed by the epidemic. The cool, wet spring is thought to have favored the growth and spread of this sycamore blight.

CAUSE OF PINK SAUERKRAUT FOUND BY EXPERIMENTS

Sauerkraut makers hate pink.

When a vat full of this product turns to this color it will not sell, for housewives are suspicious, and consequently the manufacturers sustain big money losses.

So pink to them is like red to short horn bulls. All this, however, may be changed by a series of experiments conducted at the University of Wisconsin at Madison under the direction of Dr. E. B. Fred, who has discovered that the tendency of the cabbage to turn pink during the progress of its transformation into sauerkraut is due to the presence of great numbers of wild yeasts or torulae. The greater the number of torulae in the vats the more pronounced the pink.

By proper precautions, Dr. Fred believes that this can be overcome. The favorable conditions for the development of wild yeasts are a supply of oxygen, a high temperature, high concentration of salt due to uneven distribution, and a high acetic or lactic acid content. Keep your vats air tight, he tells the manufacturers, distribute the salt evenly and keep down the temperature.

FLUORINE GAS NOW MADE BY ELECTRICITY

Announcement of a practicable generator for fluorine, the most active of all chemical elements, has been made by Dr. J. H. Hildebrand of the University of California. The method involves the electrolysis of fused potassium bifluoride, one electrode being of graphite, the other consisting of the copper container. The gas is purified by passing through copper tubes filled with sodium fluoride, which removes the hydrogen fluoride.

Fluorine is a gas at ordinary temperatures, and has such a power of grabbing up electrons that it can displace even the energetic oxygen and chlorine atoms from their compounds. Hitherto it has been difficult to prepare in quantity, and a larger supply will help in the solution of important chemical problems relating to the architecture of atoms.

The red color of the heart wood of many box-elder trees, poetically supposed by the Greeks to be "dryads' blood", is due to the invasion of a fungous parasite of the genus *Fusarium*.

ONLY EIGHT TWINS PRODUCED FROM 20,000 BIRD EGGS

In the course of experiments made in an attempt to determine the cause of twinning in birds, Dr. Oscar Riddle of the Carnegie Experimental Station observed twenty thousand incubated eggs of pigeons and doves. Out of this number only eight sets of twins appeared. It was noticed that five of these twins developed from unusually large eggs, while the other three twins originated from eggs of extremely small size. There seems to be some correlation between size of eggs and sex in twinning of pigeons and doves, since the larger eggs produced female twins and the small ones gave rise to male embryos.

Abnormal forms, or monsters, have been produced by retarding or accelerating the developmental rate. This has been done experimentally by changes of temperature and by differences in the concentration of carbon dioxide and oxygen supply. It is probable that twins in birds are produced by causes similar to those which bring about avian monsters.

PLAGUE OBSERVATION POST PLANNED FOR EAST

The Health Committee of the League of Nations has under consideration the establishment of a center for the observation and dissemination of information concerning epidemics in the Far East. Singapore will probably be selected.

Such a center, operating from such a principal southeastern Asiatic port, will be immensely useful to the nations of Asia and to European and American powers having Asiatic possessions and dependencies, experts explain. It will be able to gain prompt information concerning the outbreak of any epidemic disease, to trace its spread, and to give warning by radio and cable to other ports before the arrival of vessels bearing the infection.

The proposal has been sent on to the Council of the League for action.

ALFALFA FARMING THREATENED BY RAVAGES OF NEMATODE PEST

The alfalfa industry in the irrigated sections of the West is menaced by a widespread and serious disease. Reports indicate that alfalfa is dying in Colorado, Wyoming, and northern New Mexico as a result of the attack of a tiny worm-like parasite. This alfalfa trouble has also been reported in the past from Washington, Oregon, Idaho, and California.

About one-third of the total alfalfa produced in this country is grown under irrigation and it is this crop which seems to be especially threatened. Irrigation water probably carries the parasites from one plant to another and so aids in their spread.

To keep Swiss cheese from getting soft and losing the orthodox shape of its holes, creameries put their product through a special chilling process before shipping.

RAILWAY CARS LUBRICATED WITH CASTOR OIL

Railway chemical engineers have produced a special lubricant from castor oil which is now being used with great success on the Chinese Eastern Railway. According to reports of the traction department, it makes a most economical and efficient car lubricant. The manufacturers of this new oil have named it "Ricin" from the scientific name of the castor oil plant (*Ricinus communis*).

Castor oil is coming to be used most extensively for technical as well as medicinal purposes and in China it is also used as food.

During the past few years there has grown up in Manchuria a demand for *Ricinus* seeds as well as for technical castor oil, which are exported to Europe. The seeds are extremely rich in oils, certain species containing up to 63 per cent. This demand for seeds has caused an increased acreage to be planted under the castor oil plant. During the past autumn season castor oil seeds were sold in the Changohun region at 80-90 Mex. dollar cents per pod of thirty-six pounds and unadulterated pure technical castor oil demanded a price of Mex. \$4.

PROMINENT SCIENTISTS LECTURE TO CHILDREN

World famous scientists will explain to children the wonders of nature and the accomplishments of science at the coming meeting of the British Association for the Advancement of Science from August 6 to 13.

Children's lectures designed especially for the younger generation but delivered by highest authorities are a regular part of the programs of the British Association, both when it meets in England and abroad.

This year's meeting of the British scientists will be the first in North America in twenty years. More than 500 British scientists are expected to attend, and the total registration is expected to be over 3000. A large number of American scientists have signified their intention of attending.

Supplementing the children's lectures, the program includes citizen's lectures, which are open to the public and free. Members of the association do not usually attend these lectures, but confine their attention to the many scientific papers, "popular lectures" of general interest to groups of scientists and the "evening discourses" of general interest to all members.

A Balsam fir which may prove valuable in producing wood for paper making has been introduced into this country from China.

The recent spectacular dawn-to-dusk flight across the country by Lieut. Russel L. Maughan was made in spite of the handicap of almost constant contrary winds.